

# **2<sup>ND</sup> ANNUAL DOE SSL WORKSHOP**

## **KEYNOTE PRESENTATION**



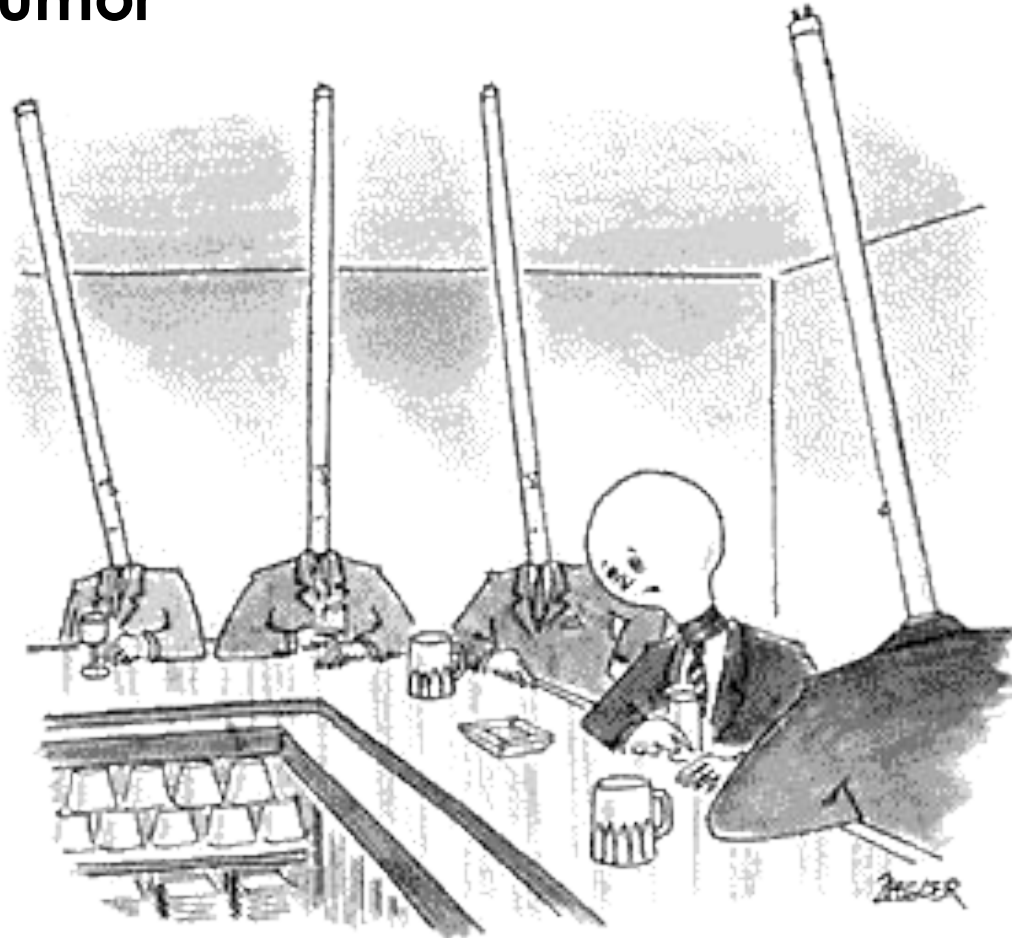
**K. Dowling, Color Kinetics**

**S. Kennedy, Kennedy & Violich Architecture, Inc.**

February 3-4, 2005

San Diego, CA

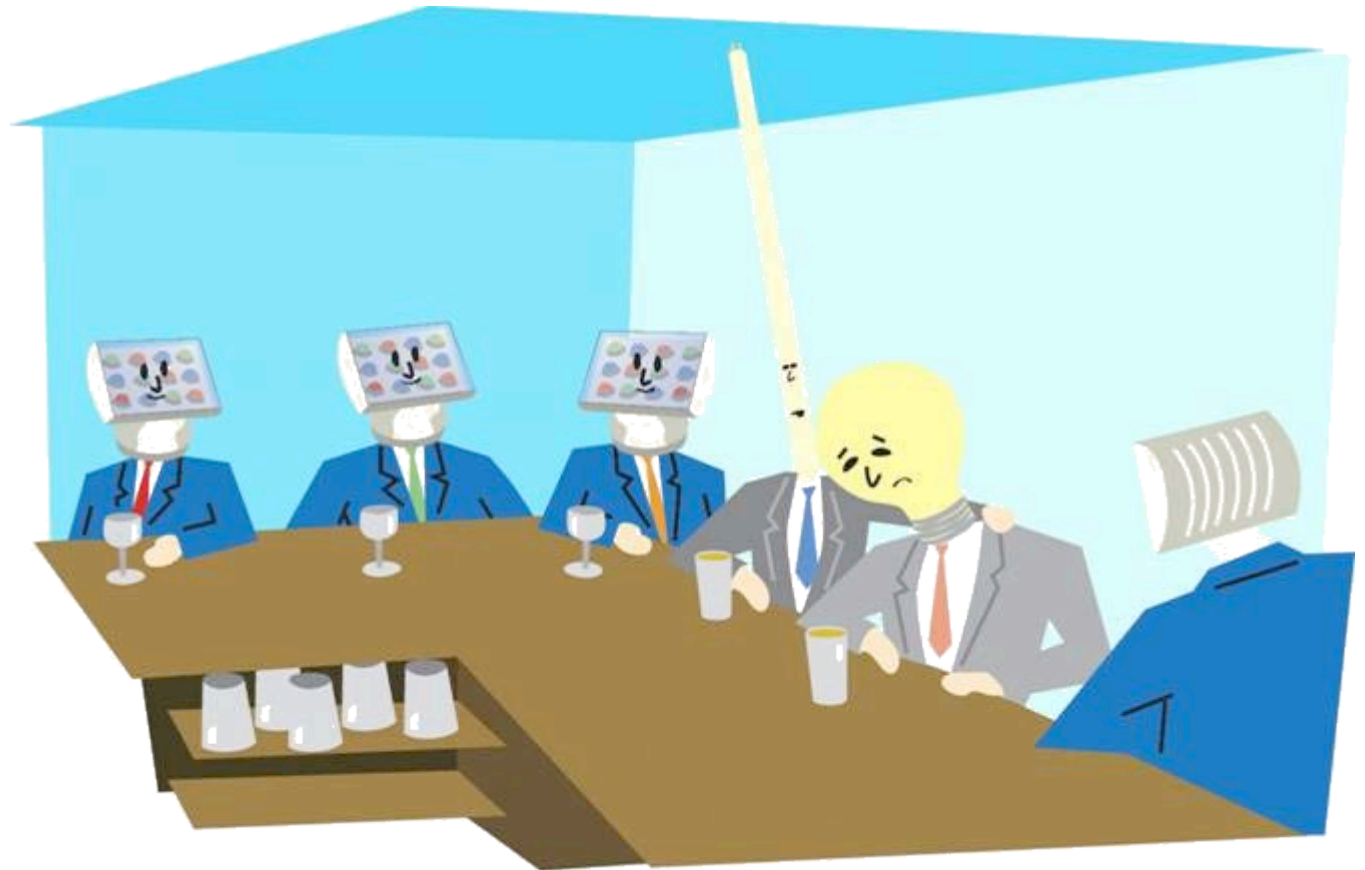
# I. Light Bulb Humor



*"Laugh if you will, but my kind once ruled the earth."*



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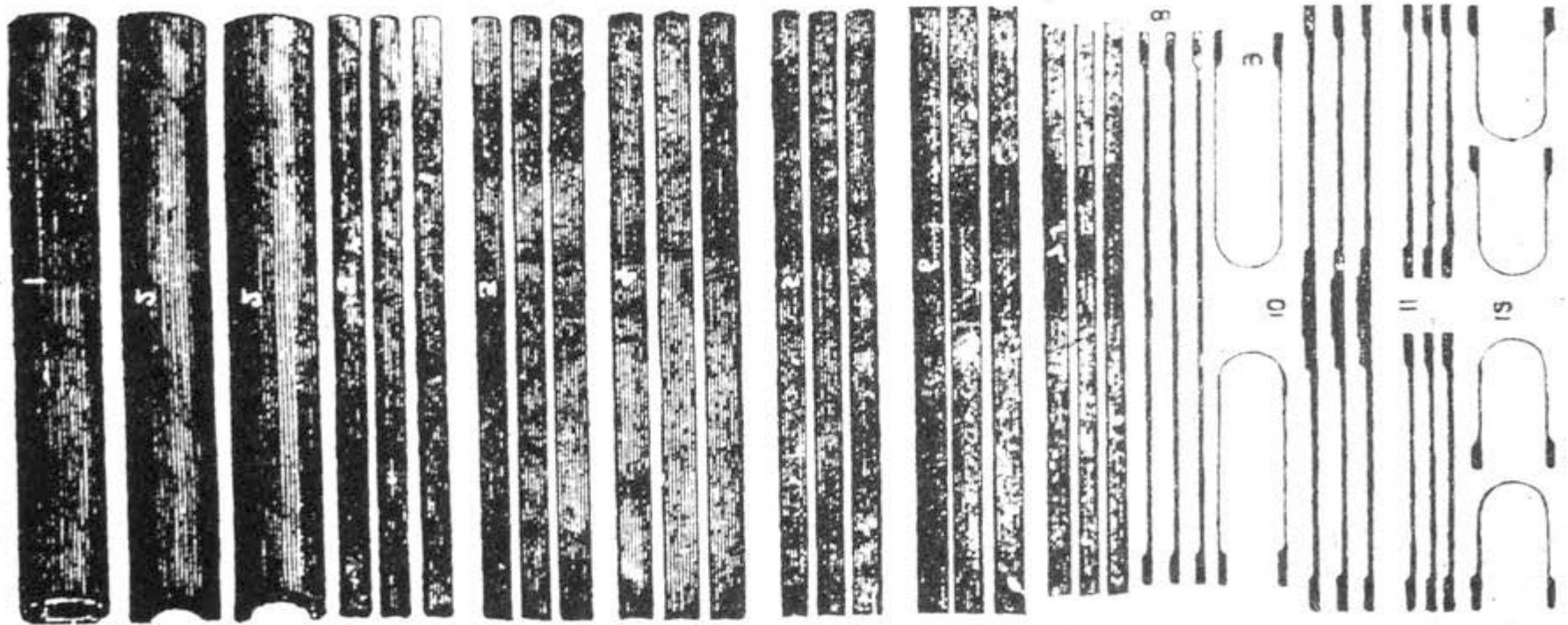


"We had a good run while it lasted..."



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## II. Looking Back at the Future of Light [SK]



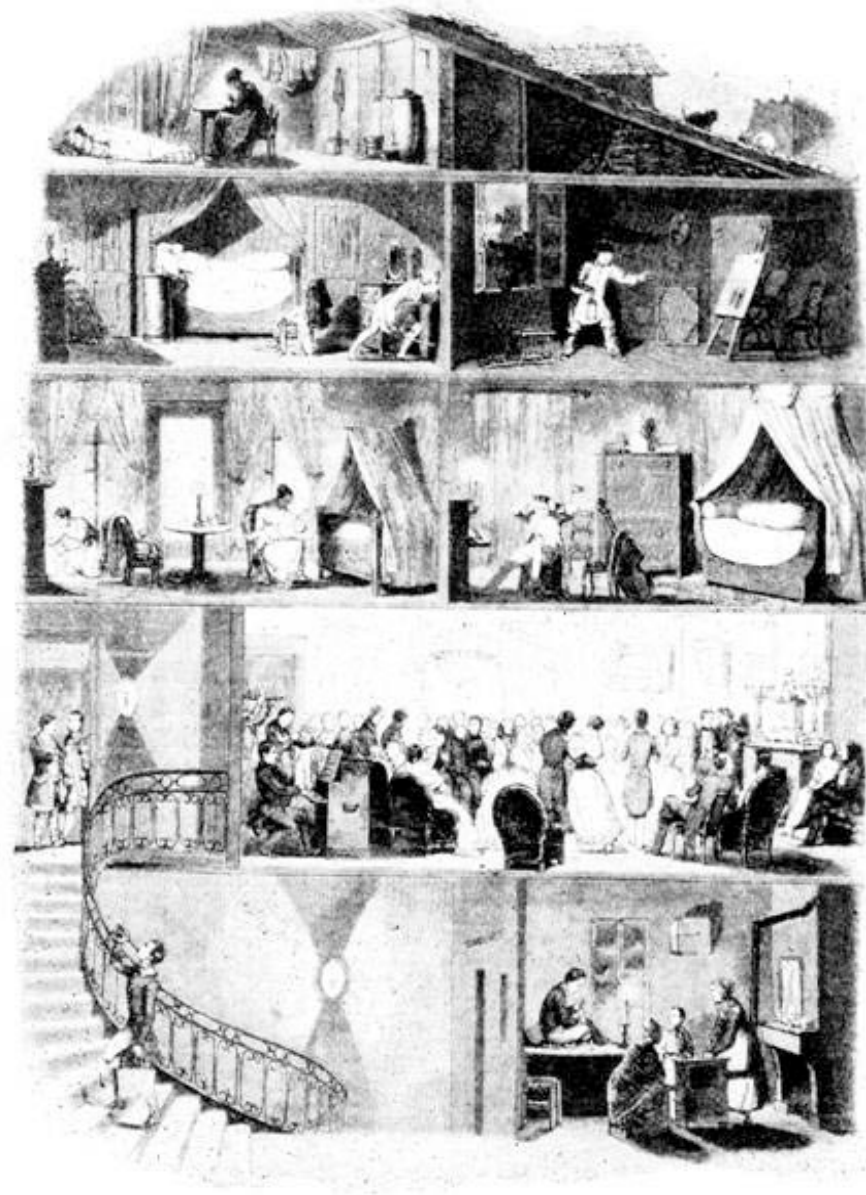
Miniaturization: shrinking wicks & filaments



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The problem of how to implement a new light technology is not new  
Nostalgia: The previous technology sets future expectations



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# GAZ A TOUS LES ETAGES

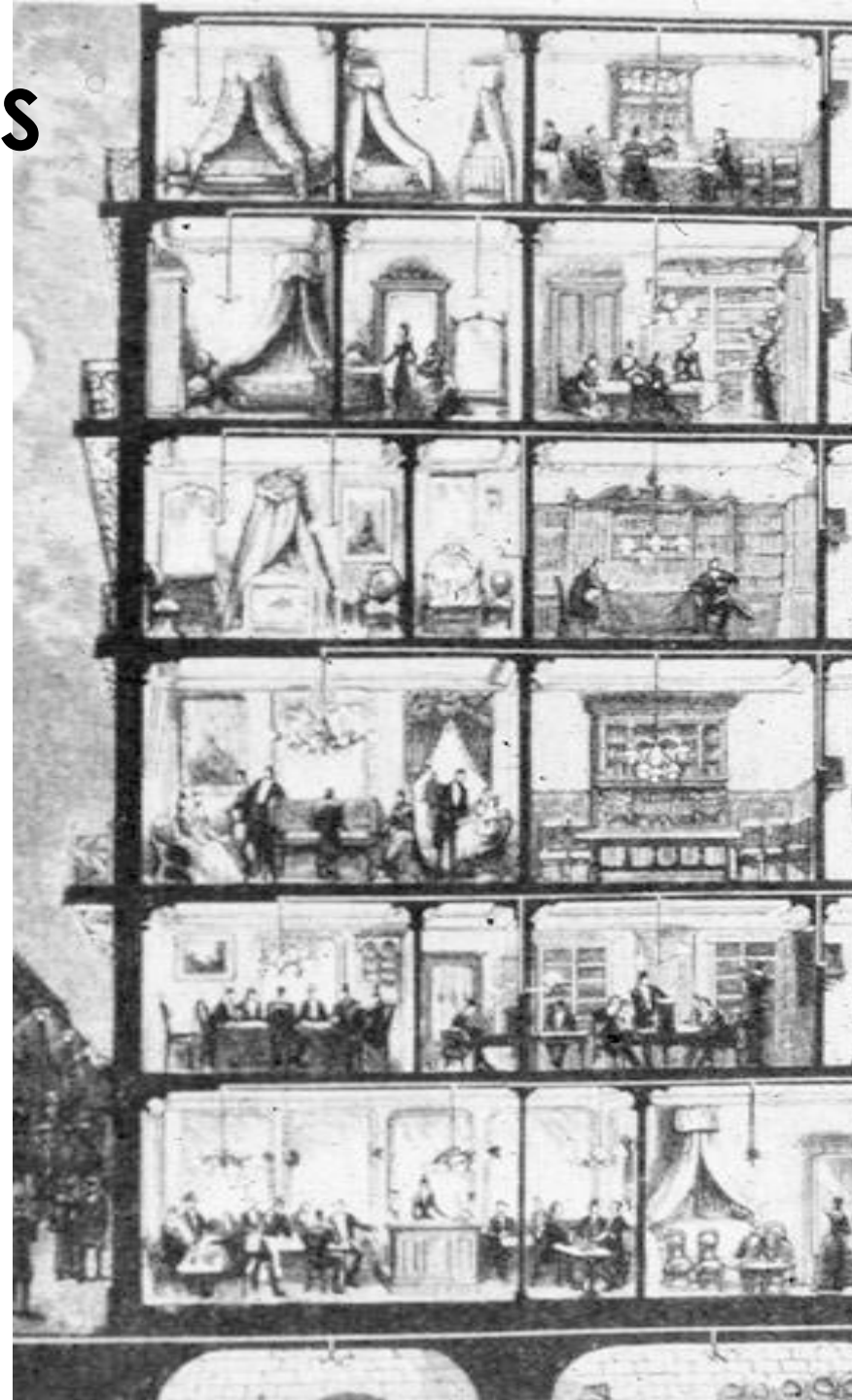


Partial implementation of gas sources

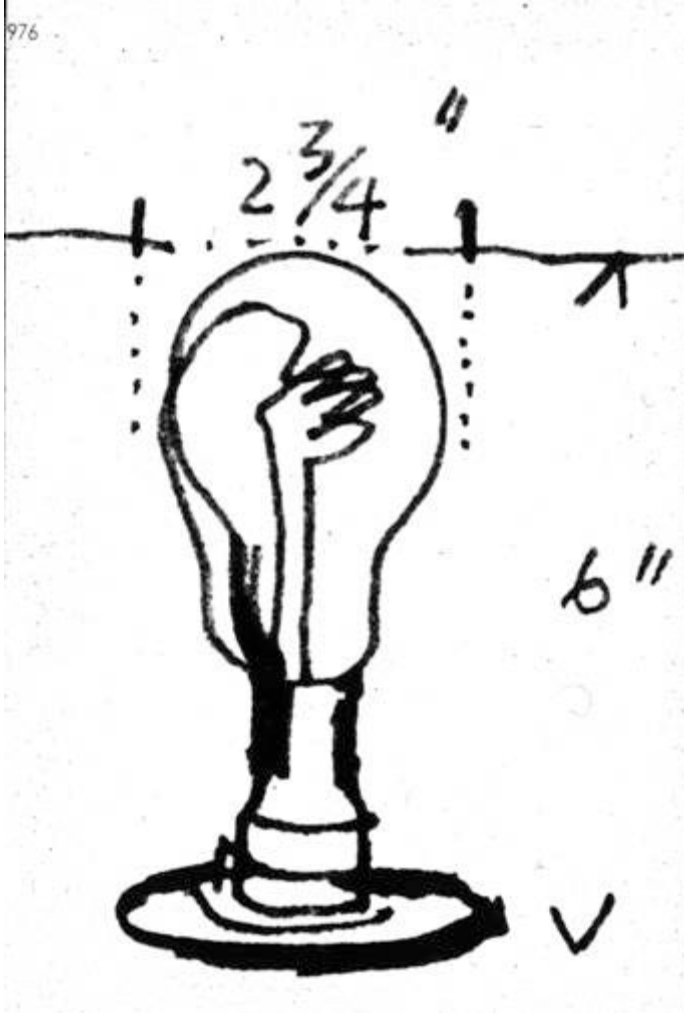
Pay per use, "Pico Power" model



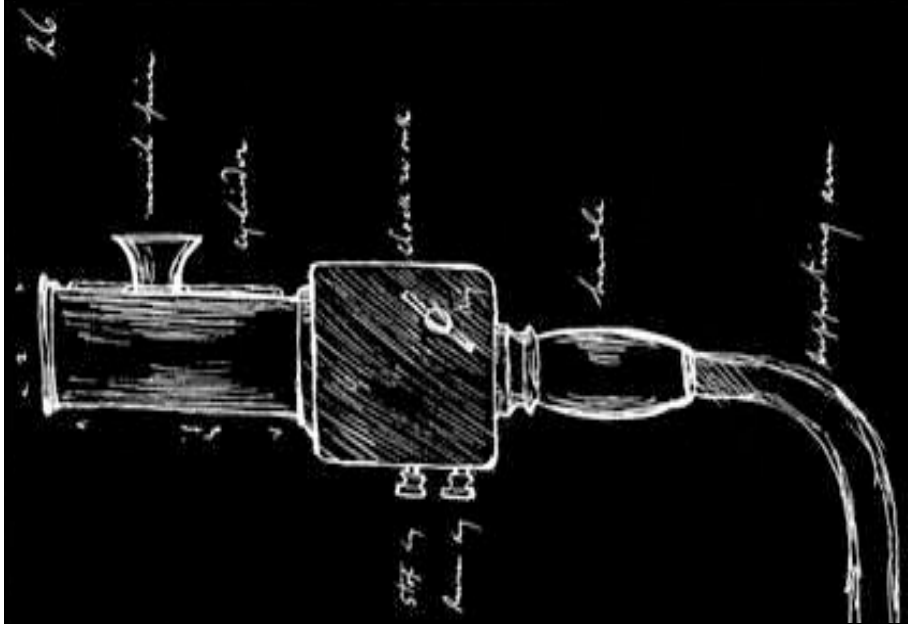
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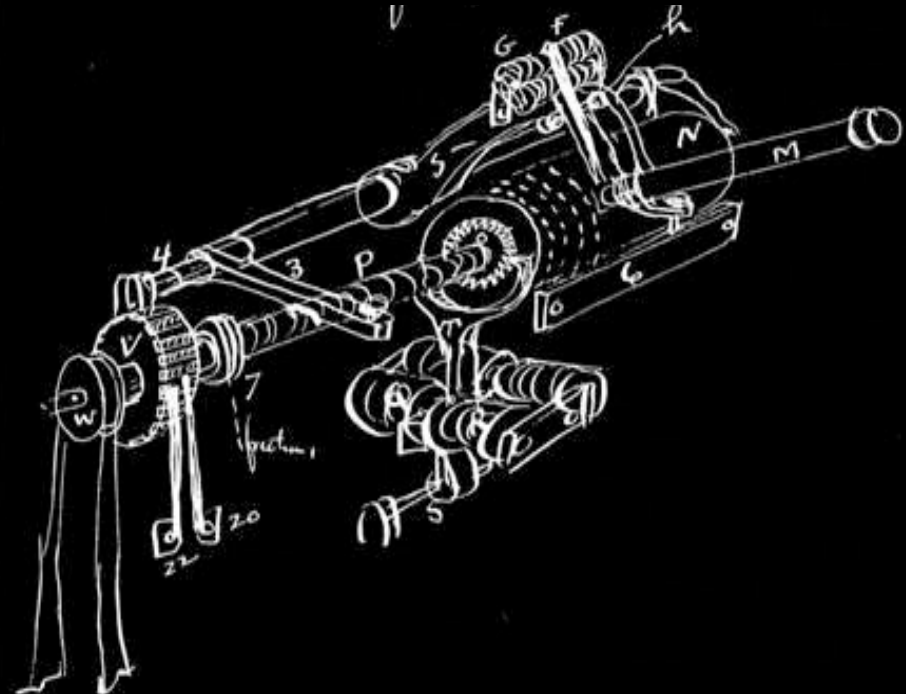
# What's at Stake for SSL



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Edison's Inventions:  
Not only technology, but also its commercial applications





FOR ONLY \$18.00 WE OFFER THE GENUINE NO-GAUGE CURRENT MEISELBERG AL-  
TERNATING, SELF-REGULATING AND ADJUSTING ELECTRIC BELT  
AS THE HIGHEST GRADE, VERY FINEST ELECTRIC BELT EVER MADE, AS THE ONLY SUCCESSFUL ELECTRIC BELT  
TREATMENT AS THE MOST POWERFUL TONIC AND CURE OF ALL SKIN AND SCALP DISEASES, IT CURES, DISAPPEARS AND PREVENTS

[illegible]

**HAVE YOU DOCTORED?** *Do you ever get a nagging feeling that your doctor is not telling you the whole story? Do you ever wonder if your doctor is really in your best interest? Do you ever feel that your doctor is just a paid employee of the medical establishment? Do you ever feel that your doctor is just a paid employee of the medical establishment? Do you ever feel that your doctor is just a paid employee of the medical establishment?*

[illegible][illegible]

Exchange Kleines Haus of the Wandlberg marks it the very first building that can be reached by wheelchair, raised approaches, hand made and finished in every part. The entrance is a grade raised path, a little for the person, wheelchair can, reaching. Land is, with wheelchair, there, fitting the very last, not perfect, situation, as seen in.

**THE BATTERY** The battery is the heart of the system. It provides the power to the system and is the most important component. The battery must be able to provide a constant voltage and current to the system. The battery must also be able to store energy for use when the system is not operating. The battery must be able to withstand the heat and vibration of the system. The battery must be able to provide a long life span. The battery must be able to provide a high level of safety. The battery must be able to provide a high level of performance. The battery must be able to provide a high level of reliability. The battery must be able to provide a high level of efficiency. The battery must be able to provide a high level of cost-effectiveness. The battery must be able to provide a high level of environmental friendliness. The battery must be able to provide a high level of safety. The battery must be able to provide a high level of performance. The battery must be able to provide a high level of reliability. The battery must be able to provide a high level of efficiency. The battery must be able to provide a high level of cost-effectiveness. The battery must be able to provide a high level of environmental friendliness.

**EVERY BELT IS PUT OUT UNDER OUR BINDING GUARANTEE**

[illegible]

## THE NO-GAUGE CURRENT

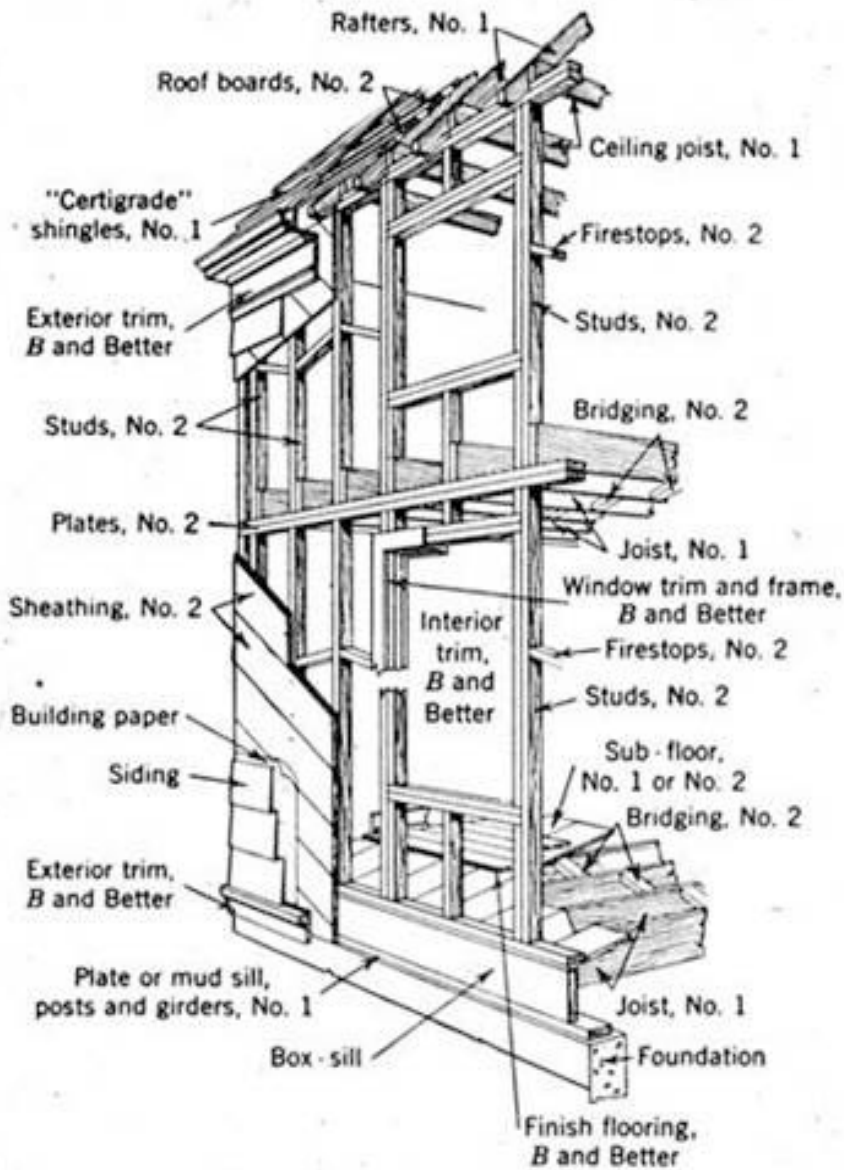
No. BR3029 OUR 80-GAUGE CURRENT BELT ..... 50

[illegible]

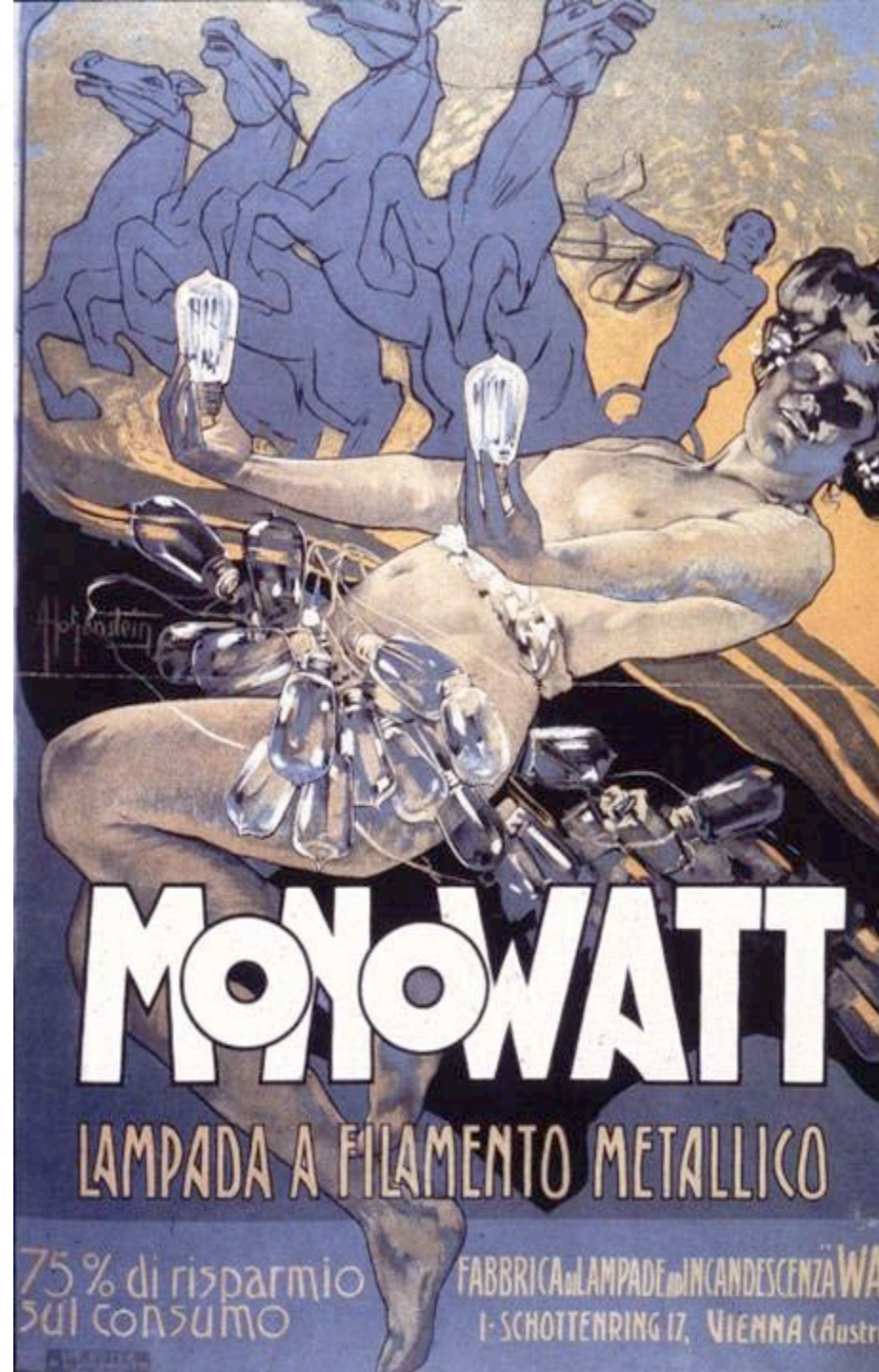
**\$8.00**

Initial niche markets:  
Some less successful...  
Even if energy efficient!





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# What's at Stake for SSL

## Analog

Vacuum tube

LP records

Film

Rotary phone

VHS

Linkages

Typewriter

## Digital

Transistor

CDs -> mp3

CCD

Cell phone

DVD

'Fly by wire'

Computer

Lighting is the last refuge of analog



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# Backlash

"...if you weren't behind this progress, there was something wrong with you," recalls ... an engineering consultant. The poor quality of many early transistor products made people feel they were taken in by the manufacturers."

Meeting expectations



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# New technologies supplanting old

But, electric light has been around 125 years

Yet candles were a \$2B industry in 2003 in the US.

Do old technologies ever die?



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# What will become of the incandescent lamp?

Heaters?

Incubators?

The 'log fire' of 2050? Unnecessary but desired

Co-Existence Lighting



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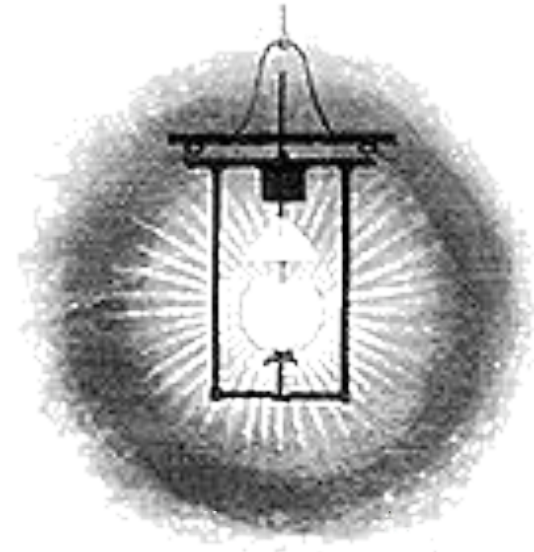
# Competition redux

Edison competed against sources that were cheaper and brighter

Arc lamp

Gas lighting

Solid-state lighting faces the same



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**Leading Edge Light ‘Loops’**

# **MATERIAL DIASPORA: DIGITAL LIGHT**

**Many Co-operative Small Sources**



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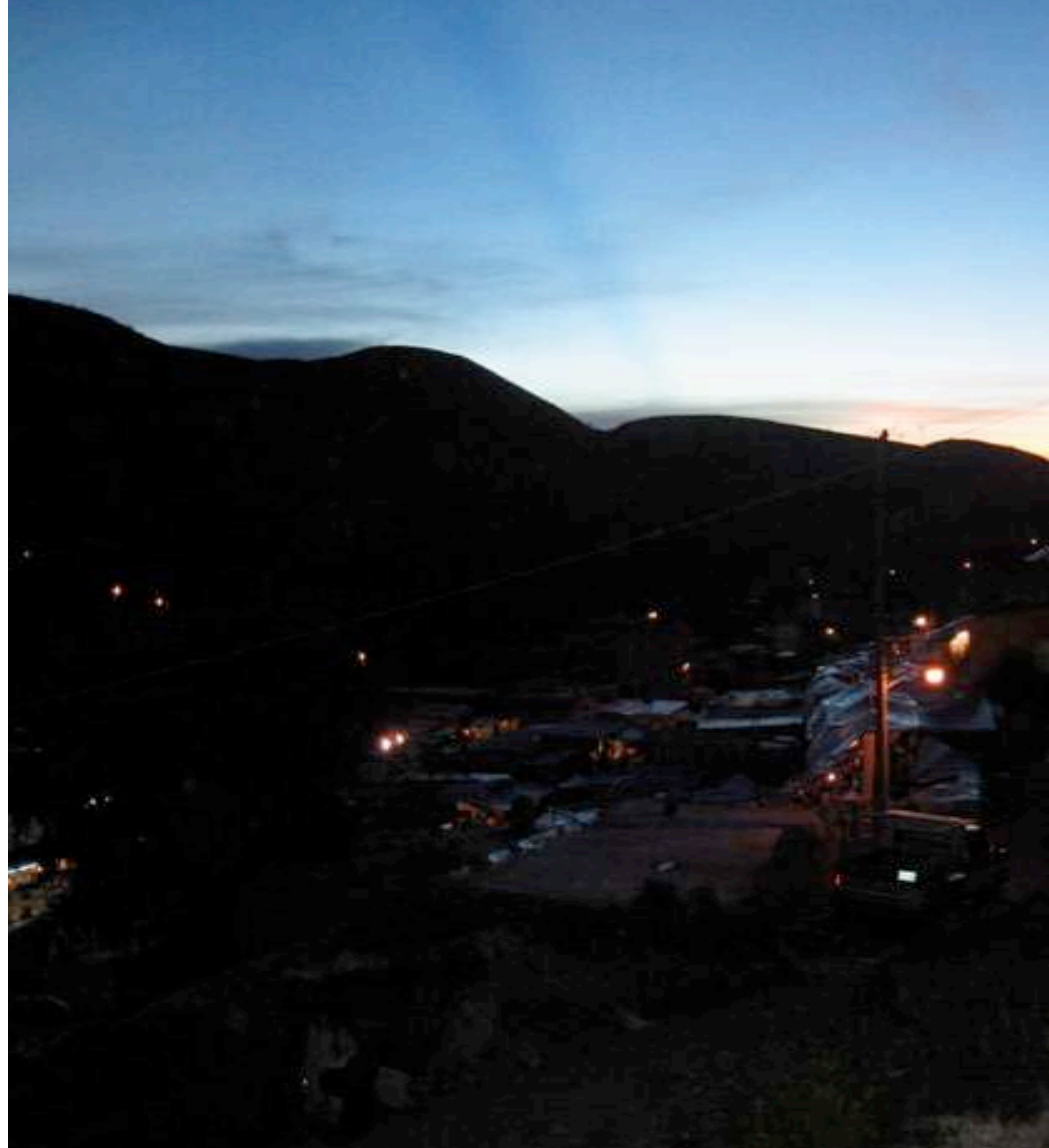
LEDs support the culture of mobility



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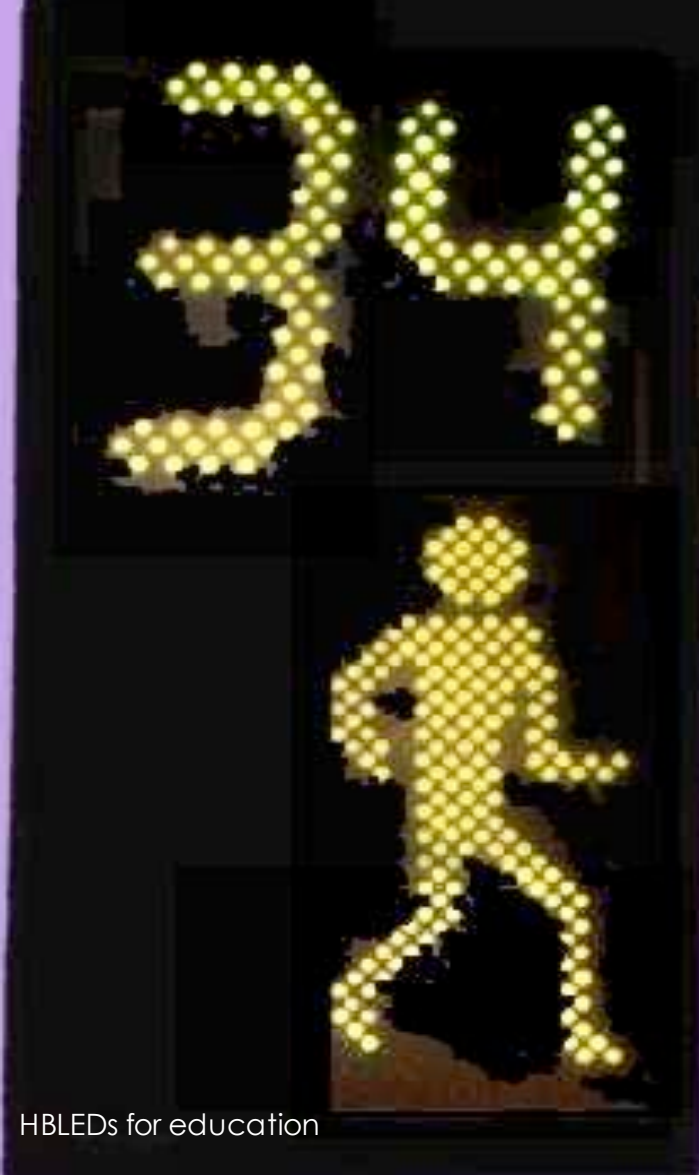


How can LED capabilities open global markets?



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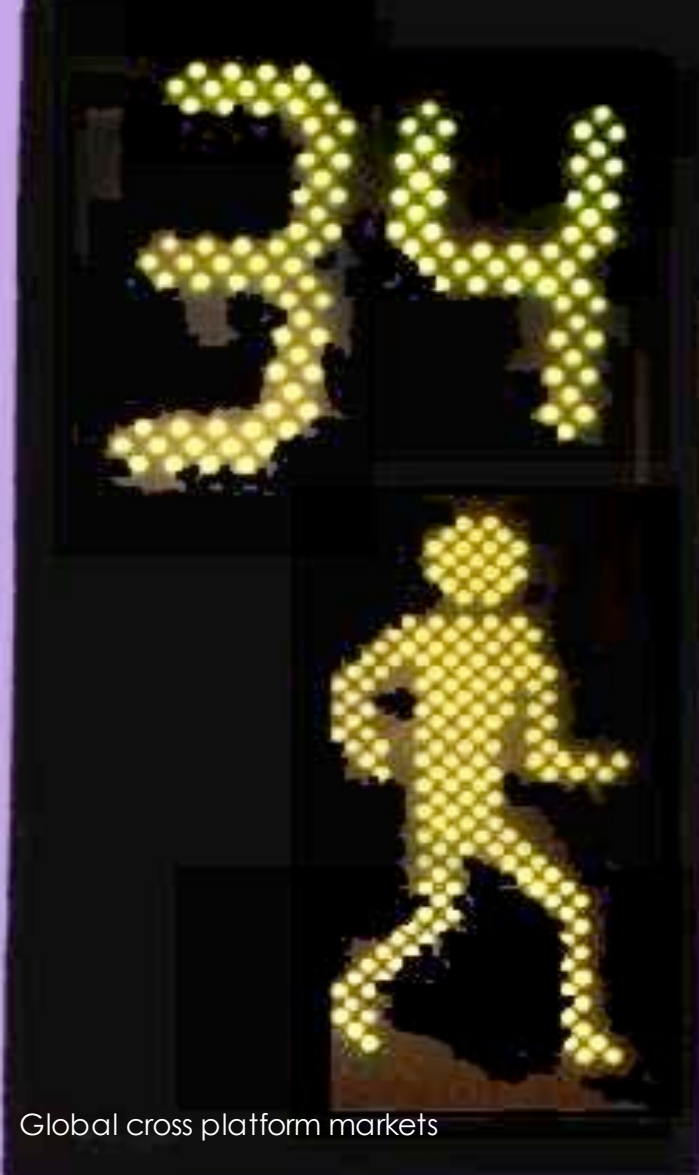
HBLEDs for education



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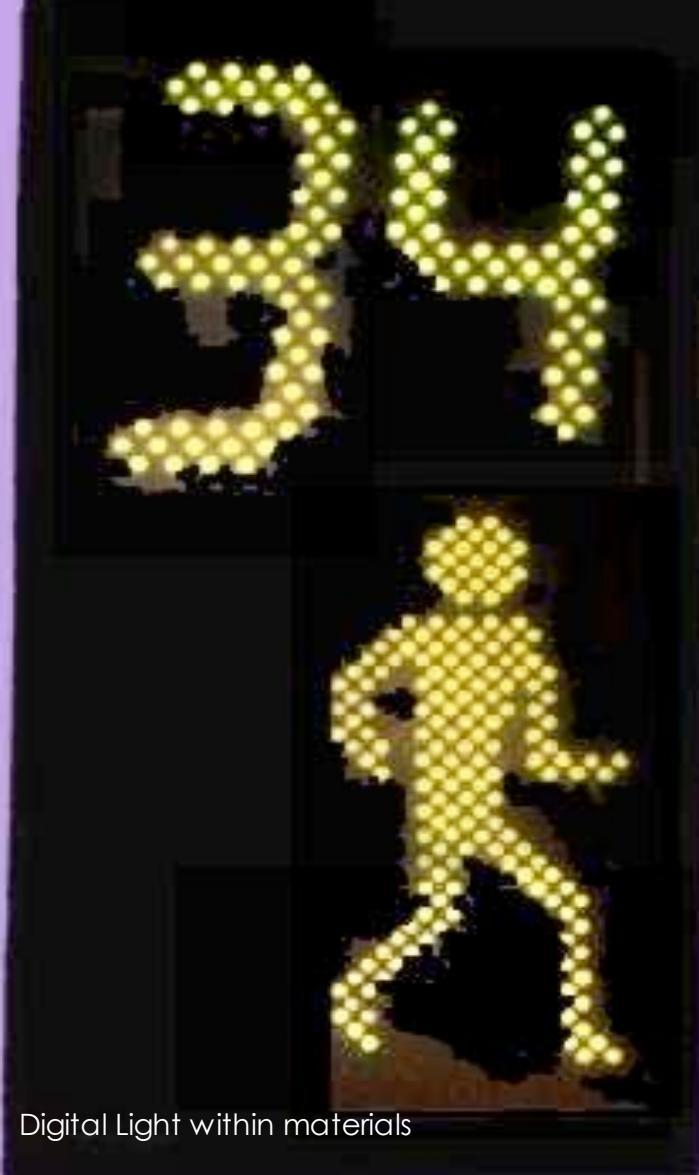


Global cross platform markets



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Digital Light within materials



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LEDs offer unique optical properties



The energy efficient diaspora of digital light  
Changes the paradigm of centralized electrical light



















A curtain of digital light



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# Intelligent Light: The Future of Control

Compete spectral control

Light synthesis

High color quality

Sensor integration

Daylight control

CT control

Security features

Levels of Control

Sources to systems

*Control will be at every level*



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# Control of White Light

Color Temperature Control

Dimming Control

*Any color white you want*



3000K

3500K

6500K



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# Time and Space

Scale

Small size

Large number

Temporal Control

Spatial Control

*Displays & lighting are blurring*



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# Where is the light?

Architectural lighting as  
Mysterious  
Compelling



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# Leading Edge Light 'Loops'

## BUILDING SCALE: DIGITAL LIGHT

### Large Surface Areas



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LEDs as active building cladding



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LEDs in architecture and building systems

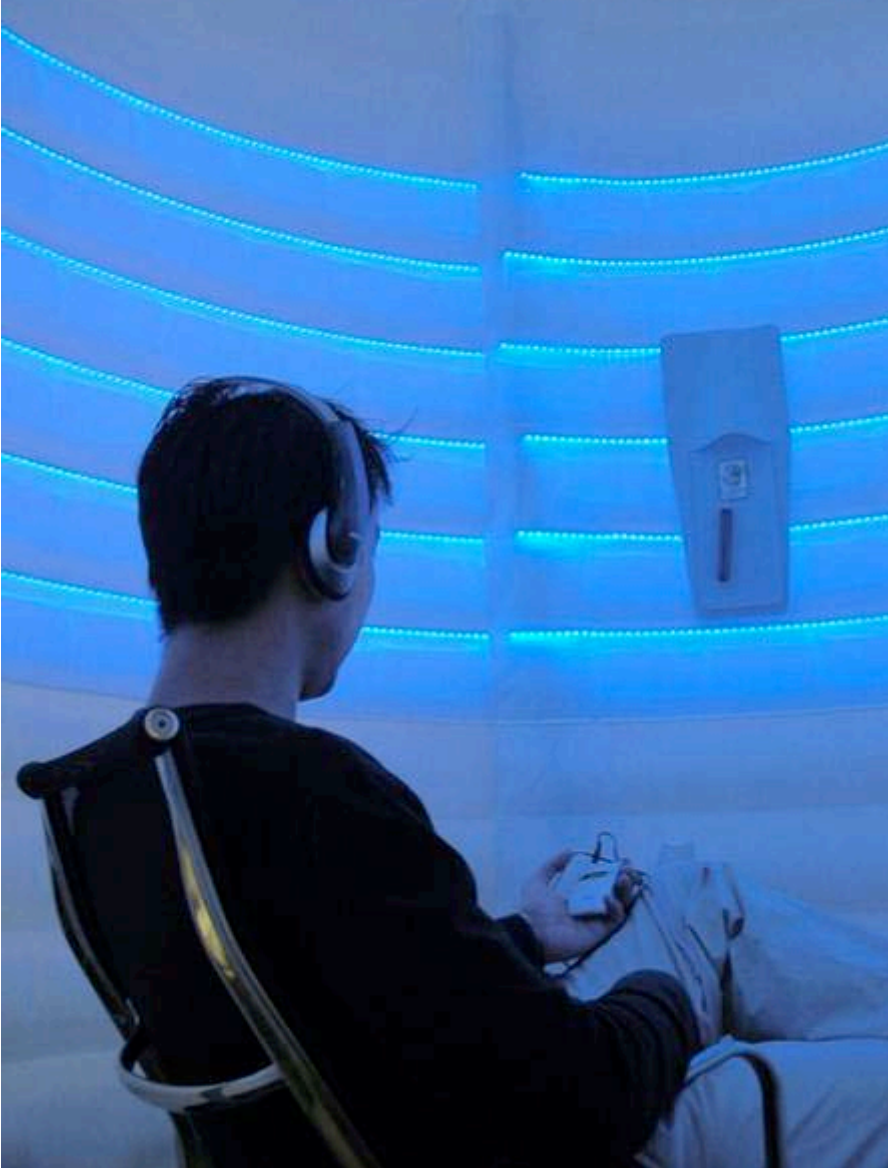


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LEDs in architecture and building systems



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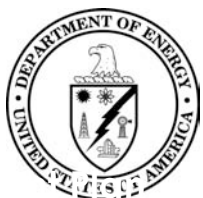
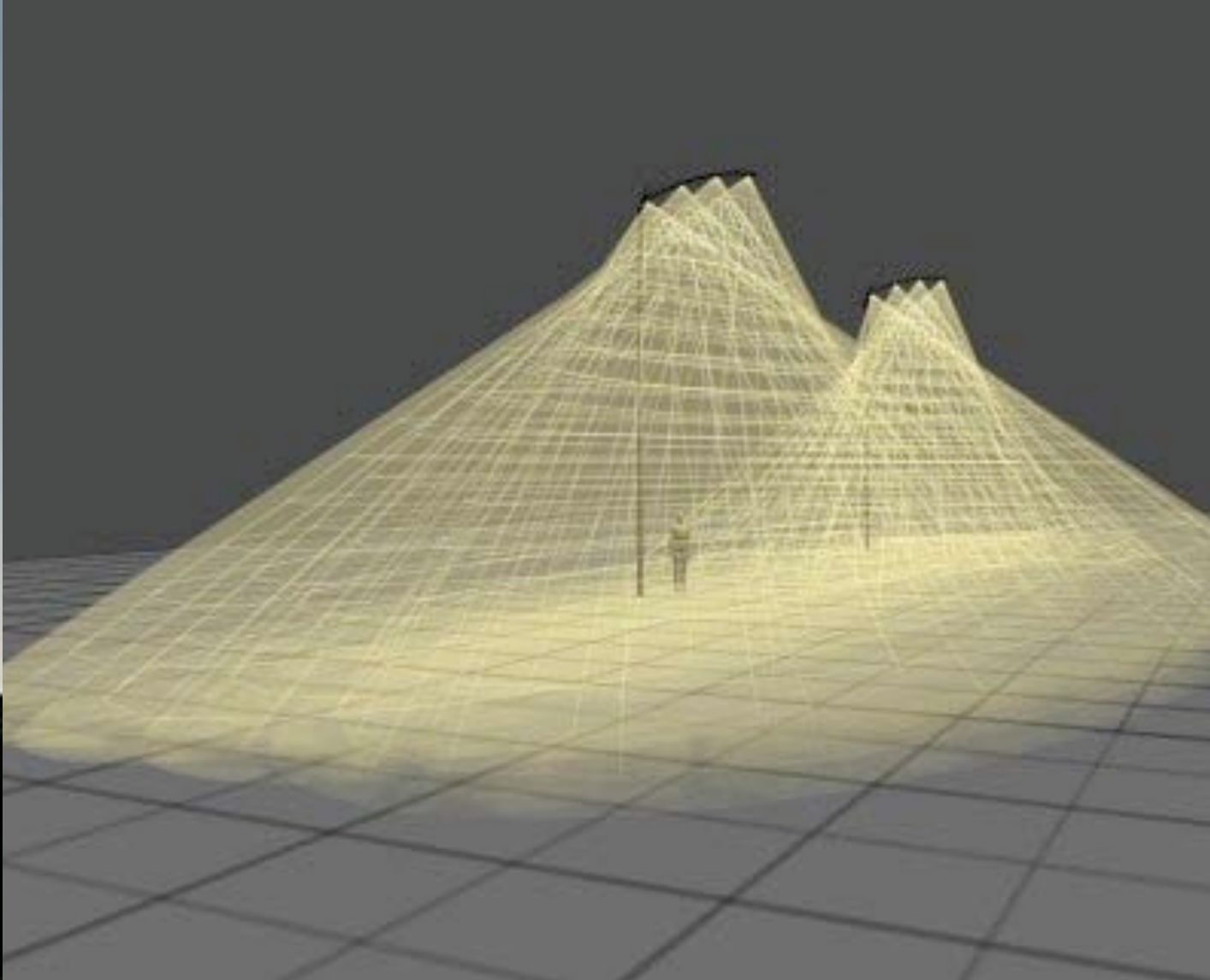
NYC Smart Street Furniture, sustainable urbanism



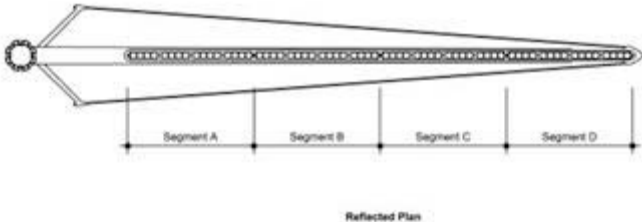
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NYC LED streetlamp prototype



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New markets in smart urban infrastructure



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## Compact fluorescent lamp

What happened?

- Expensive

- Poor light quality

- Flicker

- Expectation failure

Energy efficiency *alone* was insufficient to drive demand

This has finally changed



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## Interim: horrible hybrids

This is *not* a solid-state lighting solution

Replacement product

- Poor thermal

- Poor light output

- Poor light quality

- Makeshift appearance

A Shoehorned technology



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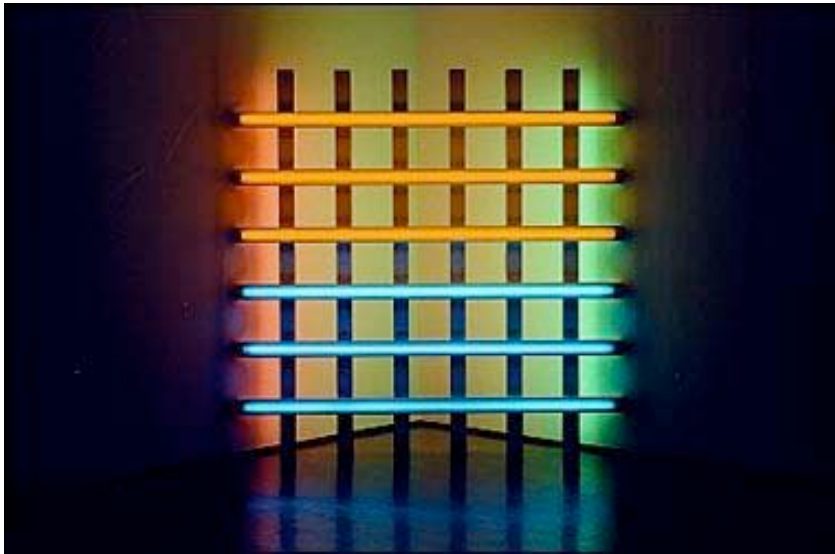


# A New Medium

Flavin to Villareal

Fluorescents to LEDs

*Light as art evolves*



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# A New Medium

New mediums imitate predecessors

Early movies = films of stage plays

Early TV = radio with pictures



Every medium needs time to form its own form and vocabulary

Solid-state lighting will do the same

*Solid state lighting is not simply a replacement technology. This approach weakens its capability*



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# SSL Value

We need R&D and market research to identify full value of SSL

*Value is hidden because it is not the lighting we know today.*



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# Easy Predictions

Solid-state sources *are* changing the face of lighting

All colored light is in transition

Performance increases

Costs decrease

Now for white LEDs

A familiar refrain: 'Not bright enough, too expensive'



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# Hard Predictions

Fixture gives way to form

Integration into structures, furniture, accessories

*The Illuminated becomes illuminating*

What happens when

- A 1000 lumen source is the size of a quarter
- Uses only 10W of energy.
- Costs of a few dollars

We do not yet understand the impact



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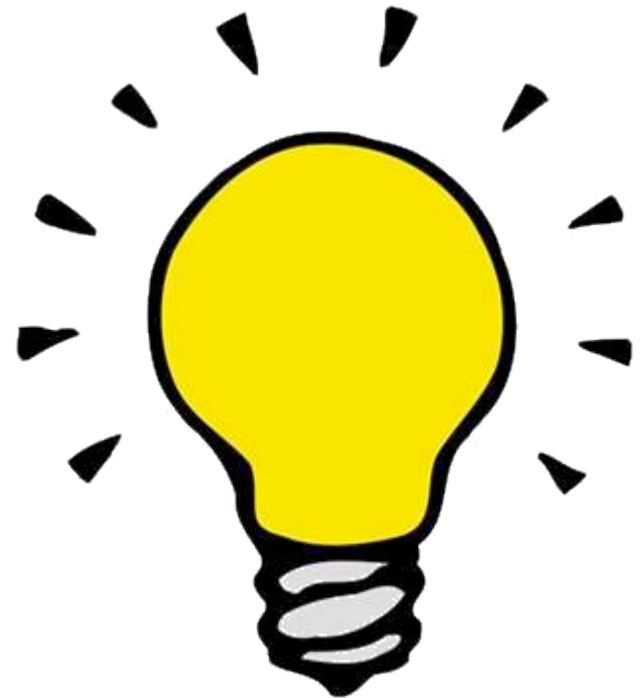


# Light bulb icon

What happens when the  
incandescent source disappears?

The icon will outlive the lamp

THANK YOU



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# Contact Information

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